VXI Enhanced Programmable Video Generator and Analyzer
Family of Instruments

Protected by one or more of the following patents:
6396536, 6502045, 7289159, 7180477, 7253792, 7289159, 7495674, 7768533, 7978218
Overview

The PVGA series of video test instruments from Advanced Testing Technologies, Inc. provide a comprehensive solution set for video generating and acquisition requirements in a UUT test environment. The first generation PVGA garnered multinational acceptance and is successfully supporting the B-1B, F-15, C-17, Eurofighter, T-50, and other diverse military platforms. The experience derived with these applications has been integrated into the next generation, the ePVGA. The ePVGA supports dual channel RGB composite video generation, stroke video generation, mixed video generation, NTSC video/S-video generation, raster video generation, and video acquisition. The ePVGA is also available with options such as hardware-based image acquisition video redisplay, automatic code generation, and digital generation and capture. New standard features include dual configuration (differential/single-ended) analog outputs and differential digital I/O. As a self-sufficient instrument, the ePVGA represents a lower cost of ownership over a la carte generic instrumentation, such as arbitrary waveform generators, by eliminating the need for complex signal switching between instruments, integration of software interfaces from multiple vendors, and the need for ancillary signal sources. Reduced nonrecurring development man-hours directly provide the benefit of shorter TPS development times and lower expenses. The new ePVGA integrated software tool environment also supports the goal of shorter TPS development times. With video instrument obsolescence issues arising, careful attention was given to supporting legacy CASS, ESTS, and RT-CASS video requirements, making the ePVGA an excellent replacement candidate. The availability of hardware-based acquisition redisplay and digital video generation makes the ePVGA an excellent candidate for new state-of-the-art platforms such as eCASS and VDATS.

ePVGA 510 Features

- Composite RGB video generation
- NTSC video/S-video generation
- Raster video generation
- Polar raster video generation
- Mixed video (stroke over composite/raster)
- Stroke video generation
- Digital video (parallel digital/flat panel, DVI, HDMI, SMPTE, SD-HDI (VESA and HD formats)) generation
- Full EDID processing functionality
- Integrated software tool environment with powerful features including GUI-based ePVGA operation, automatic C-code or macro generation, stand-alone test sequencer, expanded video imaging testing capabilities with oscilloscope-like waveform viewing, and electronic template comparison
- Supports RS170, RS343, RS330, STANAG 3350A, STANAG 3350C standards
- Automatic run time alignment of all analog parameters with remote sense capabilities
- Sophisticated control structure provides the ability to simulate dynamic and interactive displays
- Straightforward interfacing with complex UUTs such as HUDs and MPDs/MFDs
- Dual configuration analog outputs and digital I/O (differential, single-ended)
- Secondary composite video generation with differential high voltage outputs
- Full frame video acquisition (composite video, NTSC, raster video, polar raster video, DVI, SD-HDI)
- Captured video information available as raw or BMP/JPEG file types (still) or AVI (continuous)
- Voltage and timing analysis measurements for composite video
- Parallel digital video capture resolution (24 bit)
- Continuous near real-time video acquisition image redisplay via host PC monitor
- Continuous real-time video acquisition image redisplay to an external SVGA monitor
- Expanded I/O suite of signals - two standard digital 100-pin connectors and one 44-pin D-Sub 150-Ohm differential I/O connector
- General purpose user programmable timing signals for UUT synchronization
- VXI Plug & Play compatible
- Multiple DoD ATS Standards Compliance
- Built-in test
- Integrated signal routing between composite and stroke video modes to eliminate external wiring in mixed video mode

VXI Programmable Video Generator and Analyzer Board
Description
The ePVGA is a single slot, C-sized VXI instrument integrating multiple video format/multiple output video generation for general purpose testing of military or commercial platforms. All video elements are capable of fully independent and simultaneous operation. The generator elements can be used separately to test single format video displays, or in combination to test mixed video format displays. Since all outputs are automatically aligned at run time, the ePVGA delivers high accuracy signals with no periodic maintenance.

Primary Composite Video (PCV)
The PCV generates high-resolution bit-mapped images for cathode ray tube (analog) and flat panel (parallel digital) displays. Standard and non-standard scan formats are directly supported by the PCV. Two memory bitmaps (foreground and background overlay) support complex dynamic imagery. The background overlay may be superimposed on the main image. It can be updated from frame to frame as to content, position, or foreground/background status.

Primary Composite Mode
- **Timing**
  - Total frame: up to 4096 lines/frame by up to 4096 pixels/line
  - Image resolution: up to 4096 active lines by 2048 active pixels
  - Pixel rate: (RGB) 125 MHz maximum
  - Horizontal scan rate: 0.001 Hz to 200 kHz (100 ppm)
  - Vertical scan rate: 1 Hz to 1 kHz
  - Sync and blanking: any pattern with timing from 0 to full line time
  - Timing resolution for all parameters: 1 pixel
  - Scan mode: progressive, interlaced, reverse, alternate, repeat

- **Analog Outputs**
  - Maximum range: +/- 3 volts into 75 Ohms (PCV)
  - Analog accuracy: 0.5% accuracy (local sense) and 0.2% (remote sense)
  - Bandwidth: exceeds 65 MHz

Complete Image Verification of Captured Video using ENVID-GEN 510 with Option 7 (VID-SOFT)
High Resolution Composite Video Generation/Capture/Redisplay

- Pixel depth: 8-bit color palette, 12-bit resolution
  All analog levels (R, G, B, sync, blanking) individually programmable to any level within maximum range
- Multilevel output: a user configurable analog signal with four independent states (range: ±/- 3 volts) that can be arbitrarily assigned to logic states from:
  - Sync and blanking
  - Horizontal and vertical markers
  - User specified pulses
- Digital Outputs
  - Composite sync
  - Blanking
  - Horizontal marker (differential)
  - Vertical marker (differential)
  - User specified arbitrary signals (4) (differential)
  - Pixel clock (differential)
  - Parallel video data (24 bits - 8 bits each for R, G, and B)
- Digital Inputs
  - Line trigger (external synchronization)
  - Field trigger (external synchronization)
  - Video gate
  - Blanking
  - Overlay trigger/gate/modulation
  - TTL, PECL, NEC system clock
- Image Memory
  - Storage: 2048 by 4096 bitmap (foreground)
  - 2048 by 2048 bitmap (background)
- Background bitmap size: ranging from one 2048 by 2048 to 256 dynamically selectable segments of 128 by 128
- Video patterns: vectors, circles/arcs, bars, crosshatch, grayscale, RGB, dots, border, checkerboard, user-supplied bitmaps
- Real time dynamic image movement
- Position control modes
  - Continuous
  - Externally gated
  - Externally triggered
  - Repeat/non-repeat
- Image priority
  - Overlay image in front of primary image
  - Overlay image behind primary image

Secondary Video Source (SVS)
The SVS generates medium resolution bit-mapped images in any synchronized scan format. In addition, the SVS supports NTSC video to support commercial broadcast-type video. The purpose of the SVS is to produce a second video signal of either identical or different format than that of the PCV. The two video signals - PCV and SVS - can be used together (master/slave configuration) to test multi-scan monitors, video switching systems, channel isolation et al., or separately to simultaneously test multiple displays.

Secondary Composite Mode

- Timing
  - Image resolution: 1024 active lines by 1024 active pixels (RGB)
    480 active lines by 640 active pixels (NTSC)
  - Output resolution: 2048 lines (with line doubling)
  - Pixel rate: 40 MHz maximum (RGB)
    13.5 MHz maximum (NTSC)
  - Sync and blanking: any pattern with timing from 0 to full line time
  - Timing resolution: 1 pixel time
- Analog outputs: +/- 10 volts into 75 Ohms (single-ended)
  +/- 20 volts into 75 Ohms (differential)
- Digital outputs
  - Horizontal marker
  - Vertical marker
  - Composite sync
  - Blanking
**Stroke Generator (SG)**

Unlike composite video, which is a scanned technology, stroke video utilizes direct point-to-point scanning with controlled slew rates. Due to its dynamic environment, the stroke video image is continually being modified for content, flashing indicators and updating aircraft or targeting positions. With the exception of very simple patterns, such as static crosshairs and basic geometric shapes, the construction of XYZ stroke video waveforms can be a demanding, time-intensive task that will overwhelm most generic waveform generators and test development schedules. The ePVGA's SG represents the most complete stroke video generator commercially available and is designed to support military stroke video avionics. Complex, interactive images can be produced by the SG by means of its patented programmable sequence control structure which manages the order, duration, and position of image elements.

- **Stroke Analog Outputs**
  - +/- 10 volts into 75 Ohms (single-ended)
  - +/- 20 volts into 75 Ohms (differential) with 12-bit resolution and 0.5% accuracy (local sense) and 0.2% accuracy (remote sense)
  - Digital image storage: an arbitrary series of user programmed image constructs contained in a 1M by 16-bit memory
  - Digital sequence control structure storage: up to 64K sequence control blocks
  - Stroke clock: 50 MHz maximum with resolution of 0.25%
  - Image content: any user image that can be comprised of an arbitrary series of lines and arcs. Image library of alphanumeric characters and geometric shapes available through API
  - Programmable Sequence Control commands
    - Display
      - Continuous
      - Timed
      - Until external trigger
      - Gated
    - Jump
      - Goto
      - GoSub
      - For loop
      - Real-time branch
    - Dynamic motion
      - Static offset
      - Offset increment
      - Offset register select (128 available registers)

**Raster Scan Video Generation**

- **Modes**
  - XYZ deflection driven scanned video is supported in standard and nonstandard formats with image features as specified in the PCV module above.
    - Rectilinear
    - Polar (modulated)
- **Timing**
  - Line rate: any from 0.01 to 100 kHz
  - Field rate: any from 1e-5 to 1 kHz
- **Bandwidth**
  - Exceeds 5 MHz (X and Y)
  - Exceeds 40 MHz (Z)
- **Analog Outputs**
  - Line and field: +/- 10 volts into 75 Ohms (SE)
    - +/- 20 volts into 75 Ohms (differential) with 12-bit resolution; 0.5% accuracy (local sense) and 0.2% accuracy (remote sense)
  - Filters: 2 kHz, 20 kHz, 2 MHz (assigned as a function of mode and rate)
**Real Time Capture (RTC)**

The RTC performs full frame video image capture on both analog and digital video in either synchronized or deflection driven format. Captured video may be continuously redisplayed on the computer’s video monitor in near real-time.

**Capture Formats**
- Composite video
- Analog video with separate syncs
- Digital video with separate syncs
- Deflection scan (raster) video
- Stroke (XYZ) video

**Capture Redisplay**
- Image redisplayed on station monitor (no external equipment required) at a rate of up to 1/2 the input frame rate
- Compatible with all format and capture modes
- Captured images can be archived in still image format (JPEG or BMP) or motion image format (AVI)

**Analog Input Channels**
- Full scale range: +/- 0.5 volts minimum to +/- 10 volts maximum
- Bandwidth: greater than 40 MHz
- Input line rate: 4.0 to 150 kHz
- Input impedance: 75 Ohms
- Analog accuracy: run-time aligned to +/- 0.2% (card input pin)

**Digital Video Input**
- Parallel digital video inputs (8 bits by 3 channels)

**Control Modes**
- Internal
- External - gated
- External - triggered

**Video Integrated Development Software (Option 7 - VID-SOFT)**

The ePVGA is now available with a powerful integrated software suite, VID-SOFT. VID-SOFT is a broad software tool environment designed to accelerate test development, minimize or eliminate programming, and offer powerful automated and visual tools with which to automatically validate a wide spectrum of video formats.

The components of VID-SOFT are:

**ePVGA Graphical User Interface**
- Point-and-click programming of the ePVGA, VRT, and VSA components
- Automatic code generation linked to GUI panel selections
- Macro recorder to combine statements for later playback
- ePVGA programming wizards

**Video Redisplay Tool (VRTX)**
- Continuous redisplay of the captured video image on the host PC’s monitor
Video Redisplay Tool
The Video Redisplay Tool software allows all video formats captured with the RTC (Real Time Capture mode) to be continuously streamed to the host PC and displayed on the host monitor for visual operator verification. Options such as frame averaging, image decay, and bandwidth filtering are available to aid in the visual presentation.

Available Performance Levels for the ePVGA Enhanced Version
The ePVGA is factory-configured at time of purchase.
- Video Redisplay
  - Real-time hardware-based scan conversion of video capture
  - Converts special format video signals to a video signal viewable with an external analog monitor
  - Upgrades all video acquisition modes to real-time continuous capture
- DVI Digital Video (Double-Slot VXI Module)
  - DVI Digital Video Generation (162 MHz maximum rate)
  - DVI video capture
  - Full EDID capabilities
- HDMI Digital Video (Double-Slot VXI Module)
  - Full infoframe capture/analysis
  - Optional audio capture
- HD-SDI Digital Video (Double-Slot VXI Module)
  - Copper/fiber optic
  - Packet capture/analysis

Virtual Spectrum Analyzer (VSA)
- Patented waveform analysis software
- Continuous three-channel (RGB) video waveform display with overlays, error bounds, analog persistence, filtering, averaging, peak detection
- Image measurements via 2D threshold analysis and automatic image validation via electronic template comparison with programmable accuracy

Test Sequencer Module
- Stand-alone tool to automatically execute ePVGA macros by invoking ePVGA, VRT, and VSA functions
- Programmable error limits with pass/fail reporting
**ATTI Company Profile**

The corporation:
- Has designed, developed and manufactured ATE since 1987
- Has delivered and supported many test systems in both the commercial and military sectors
- Is an innovator in developing and implementing VXI technology solutions
- Has developed over one thousand test program sets, covering the test spectrum from simple to extremely complex
- Has numerous satisfied customers, including:
  - Agusta, Italy
  - Boeing
  - Escas, Turkey
  - Havelsan, Turkey
  - Hellenic Air Force
  - Japanese Air Force
  - KLM Royal Dutch Airlines
  - Lockheed Martin
  - NATO
  - Northrop Grumman
  - Palomar Products, Inc.
  - Royal Saudi Air Force
  - US Air Force
  - US Navy

**ATTI Worldwide Support**

The corporation:
- Has developed Obsolescence Mitigation Replacement (OMR) technology which represents ATTI's corporate commitment to customer use and TPS investment in our test systems
- Has delivered BRAT test systems worldwide
- Offers one of the most experienced service, training and support teams in the world
- Has worked with our customers solving diverse test challenges in digital, analog, and RF applications
- Is committed to total hardware and software support including service, spares, upgrades, documentation, training, and configuration control
- Has the financial efficacy to guarantee long-term commitments

**ATTI Offices**

**Corporate Headquarters**
110 Ricefield Lane, Hauppauge, NY 11788,
phone: (631) 231-8777, 1-800-ATTI-VXI, fax: (631) 231-7174
www.attinet.com

**Field Offices**

**Warner Robins, GA**
127 Osigian Blvd., Warner Robins, GA 31088
phone: (478) 953-6356, fax: (478) 953-6494

**Layton, UT**
2985 N 935 E, Suite 1, Layton, UT 84041
phone: (801) 771-7259